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CLAIMS

[Claim(s)]
[Claim 1] Were divided by the peripheral wall, the septum arranged inside said peripheral wall, and said septum. Two or more honeycomb segments which have the circulation hole of a large number penetrated to shaft orientations It is the honeycomb structure object which comes to carry out junction unification through a junctional zone. Respectively the thermal conductivity and thickness of said peripheral wall kappac (W/mK) and dc(cm), Respectively the thermal conductivity and thickness of a junctional zone which are formed on said peripheral wall kappaa (W/mK) and da(cm), When the thermal conductivity and thickness of a layer which doubled said peripheral wall and said junctional zone are respectively set to kappa (W/mK) and d (cm) The honeycomb structure object characterized by including the peripheral wall and junctional zone which are the relation between d/ [(kappaa/deca)+(kappac/dc)] >= kappa>=d / [(kappaa/deca) +(kappac/dc)] x0.6.
[Claim 2] The honeycomb structure object according to claim 1 characterized by including the particulate matter A with which it is formed of baking of the baking raw material with which a peripheral wall contains particulate matter S, and said junctional zone has the mean particle diameter which is the range of 1 / 100 - 1/2 to the mean particle diameter of said particulate matter S.
[Claim 3] The honeycomb structure object according to claim 2 characterized by including the interlayer currently directly formed on the peripheral wall including the particulate matter A with which said junctional zone has the mean particle diameter which is the range of 1 / 100 - 1/2 to the mean particle diameter of said particulate matter S, and a glue line.
[Claim 4] A honeycomb structure object given in claim 1 characterized by including the layer formed from the raw material with which a junctional zone contains the liquid which has the surface tension of 70 or less dyn/cm in 25 degrees C thru/or any 1 term of 3.
[Claim 5] The honeycomb structure object according to claim 4 characterized by said liquid contained in the raw material of a junctional zone containing the organic substance which a consistency is the liquid of 0.9 - 1.1 g/cm3, and has surface tension smaller than water in 25 degrees C, and water.
[Claim 6] A honeycomb structure object given in claim 1 characterized by a junctional zone containing the ceramics thru/or any 1 term of 5.
[Claim 7] A honeycomb structure object given in claim 1 to which a honeycomb segment is characterized by using silicon carbide or silicon-silicon carbide composite material as a principal component thru/or any 1 term of 6.
[Claim 8] A honeycomb structure object given in claim 1 characterized by carrying out the closure of the opening of the predetermined circulation hole in a honeycomb segment in the end face of 1, and carrying out the closure of the opening of a residual circulation hole in other end faces thru/or any 1 term of 7.
[Claim 9] A honeycomb structure object given in claim 1 to which more than 70 capacity % of a honeycomb structure object is characterized by consisting of 900mm honeycomb segments it is [segments] 2 2-10000mm by the cross section thru/or any 1 term of 8.
[Claim 10] The formation process which forms the honeycomb segment which has a peripheral wall, the septum arranged inside said peripheral wall, and the circulation hole of a large number penetrated to the shaft orientations divided by said septum, It is the manufacture approach of a honeycomb structure object given in claim 1 including the junction process which joins said honeycomb segment

and forms a honeycomb structure object thru/or any 1 term of 9. Said formation process includes the baking process which calcinates the baking raw material containing particulate matter S. Said cement receives the mean particle diameter of the particulate matter S in said baking raw material, including the process which gives cement for said junction process to form a junctional zone on a peripheral wall, and the process which unifies a honeycomb segment. The manufacture approach of the honeycomb structure object characterized by including the particulate matter A which has the mean particle diameter of 1 / 100 - 1/2.

[Claim 11] The manufacture approach of the honeycomb structure object according to claim 10 characterized by including the process at which said process which gives cement for a junction process to form a junctional zone gives the interlayer agent for forming the interlayer of at least one layer on the peripheral wall of a honeycomb segment, and the process which gives the adhesives for forming the glue line of at least one layer.

[Claim 12] The formation process which forms the honeycomb segment which has a peripheral wall, the septum arranged inside said peripheral wall, and the circulation hole of a large number penetrated to the shaft orientations divided by said septum, It is the manufacture approach of a honeycomb structure object given in claim 1 including the junction process which joins said honeycomb segment and forms a honeycomb structure object thru/or any 1 term of 9. The process to which said junction process gives the cement for forming the junctional zone of at least one layer on a peripheral wall, The manufacture approach of the honeycomb structure object characterized by said cement containing the liquid which has the surface tension of 70 or less dyn/cm in 25 degrees C including the process which unifies a honeycomb segment.

[Claim 13] The manufacture approach of the honeycomb structure object according to claim 12 characterized by said liquid which has the surface tension of 70 or less dyn/cm in 25 degrees C containing the organic substance which a consistency is the liquid of 0.9 - 1.1 g/cm3, and has surface tension smaller than water in 25 degrees C, and water.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention can control too much rise of especially temperature about the honeycomb structure object used for the particle uptake filter in exhaust gas, such as an internal combustion engine and a boiler, etc., and dispersion in temperature distribution is related with the honeycomb structure object which was excellent in endurance few, and its manufacture approach.
[0002]
[Description of the Prior Art] The honeycomb structure object is used for the uptake filter of the particle in exhaust gas, such as an internal combustion engine and a boiler, especially a diesel particle etc.
[0003] The honeycomb structure object used for such the purpose has the structure where while becomes the opposite side mutually and the closure of the adjoining circulation hole 3 was generally carried out at the end so that it might have the circulation hole 3 of a large number penetrated to X shaft orientations divided by the septum 2 and an end face might present the shape of a checker, as shown in drawing 5 (a) and (b). In the honeycomb structure object which has such structure, a processed fluid is discharged from the circulation hole 3 with which it flows into the circulation hole 3 3 with which the closure of the input side edge side 42 is not carried out, i.e., the circulation hole with which the closure of the edge is carried out in respect of [44] the outflow hole side edge, the closure of the edge is carried out through the porous septum 2 in respect of [42] the next circulation hole 3, i.e., an incurrent-pore side edge, and the closure of the outflow hole side edge side 44 is not carried out. Under the present circumstances, a septum 2 serves as a filter, for example, the soot (soot) discharged from a diesel power plant is caught by the septum, and it deposits on a septum. Thus, the temperature distribution within honeycomb structure became uneven by the temperature change with rapid exhaust gas, or local generation of heat, and the honeycomb structure object used had problems, such as producing a crack on a honeycomb structure object. When used as a filter (it is called Following DPF) which carries out uptake of the particulate matter under exhaust air of a diesel power plant especially, the collected carbon particle was burned, to remove and reproduce is required, local elevated-temperature-ization started on this occasion, and there was a problem of being easy to generate the decline in regeneration efficiency by ununiformity-izing of regenerating temperature and the crack by big thermal stress. Moreover, since the temperature distribution at the time of playback were not uniform, it was difficult to consider as optimum temperature over the whole filter, and it difficult to aim at improvement in regeneration efficiency.
[0004] For this reason, the approach of joining the segment which divided the honeycomb structure object into plurality with a jointing material for corrugated fibreboard was proposed. For example, the manufacture approach of the honeycomb structure object which joins much honeycomb objects to a U.S. Pat. No. 4335783 official report with a discontinuous jointing material for corrugated fibreboard is indicated. Moreover, after carrying out extrusion molding of the matrix segment of the honeycomb structure which consists of a ceramic ingredient to JP,61-51240,B, processing the periphery section after baking and making it smooth, it is substantially [as a matrix segment] the same, and the thermal-shock-resistance rotation accumulation type at which the difference of coefficient of thermal expansion applies and calcinates [the mineral composition after calcinating to the joint] the ceramic jointing material for corrugated fibreboard which becomes with 0.1% or less

in 800 degrees C is propose. Moreover, the ceramic honeycomb structure object which similarly joined the honeycomb segment of cordierite to the SAE paper 860008 in 1986 into cordierite cement is indicated. Furthermore, the ceramic honeycomb structure object which pasted up the honeycomb ceramic member on JP,8-28246,A by the nature sealant of elasticity which consists of the inorganic fiber which is each other interwoven with in three dimensions at least, an inorganic binder, an organic binder, and an inorganic particle is indicated. Moreover, thermal conductivity is high and to prevent local elevated-temperature-ization and to prevent breakage of the honeycomb structure object by thermal stress is also tried by making a honeycomb structure object using the ingredient of a heat-resistant high silicon carbide system etc.

[0005] however, the thing to segment -- and/or, although the breakage by thermal stress could be controlled to some extent by using a heat-resistant high ingredient like the ingredient of a silicon carbide system, the temperature gradient of the periphery section of a honeycomb structure object and a core could not be canceled, but it was inadequate in respect of improvement in the endurance by uniform playback. Moreover, also when local generation of heat at the time of playback arose, it was.

[0006] Moreover, the thickness of a sealant layer (junctional zone) is 0.3-5mm, and the filter which equalizes the whole temperature and a partial cinder cannot produce easily due to the thermal conductivity considering as the ceramic filter aggregate of 0.1 - 10 W/mk is indicated by the JP,2001-162119,A official report. however, junction -- thickness -- ** -- the temperature gradient generated when what can lose a partial cinder and can gather the regeneration efficiency of a soot by making thermal conductivity into the fixed range carries out elevated-temperature generation of heat locally -- controlling -- thermal stress -- stopping -- not enough -- a soot -- in respect of improvement in the refreshable amount of marginal soots, it was inadequate.

[0007]

[Problem(s) to be Solved by the Invention] the case where this invention was made in view of such a situation, and the place made into the purpose could control too much rise of temperature, excelled in endurance, and it uses especially as DPF -- a soot -- it is in offering the expensive honeycomb structure object and its manufacture approach of the refreshable amount of marginal soots.

[0008]

[Means for Solving the Problem] The septum by which this invention has been arranged [1st] inside a peripheral wall and said peripheral wall, Two or more honeycomb segments which have the circulation hole of a large number penetrated to shaft orientations divided by said septum It is the honeycomb structure object which comes to carry out junction unification through a junctional zone. Respectively the thermal conductivity and thickness of said peripheral wall kappac (W/mK) and dc (cm), Respectively the thermal conductivity and thickness of a junctional zone which are formed on said peripheral wall kappaa (W/mK) and da(cm), When the thermal conductivity and thickness of a layer which doubled said peripheral wall and said junctional zone are respectively set to kappa (W/mK) and d (cm) The honeycomb structure object characterized by including the peripheral wall and junctional zone which are the relation between d/[(kappaa/deca)+(kappac/dc)] >= kappa>=d / [(kappaa/deca) +(kappac/dc)] x0.6 is offered (1st invention).

[0009] In the 1st invention, it is formed of baking of the baking raw material with which a peripheral wall contains particulate matter S. It is desirable that the particulate matter A with which said junctional zone has the mean particle diameter which is the range of 1 / 100 - 1/2 to the mean particle diameter of said particulate matter S is included. It is still more desirable that the interlayer currently directly formed on the peripheral wall including the particulate matter A with which said junctional zone has the mean particle diameter which is the range of 1 / 100 - 1/2 to the mean particle diameter of said particulate matter S, and a glue line are included. Moreover, it is desirable that the layer formed from the raw material with which a junctional zone contains the liquid which has the surface tension of 70 or less dyn/cm in 25 degrees C in the 1st invention is included, and it is still more desirable that said liquid contained in the raw material of a junctional zone contains the organic substance which a consistency is the liquid of 0.9 - 1.1 g/cm3, and has surface tension smaller than water in 25 degrees C, and water. Moreover, it is desirable that a junctional zone contains the ceramics and it is desirable that a honeycomb segment uses silicon carbide or silicon-silicon carbide composite material as a principal component. Moreover, it is desirable that the closure of the

opening of the predetermined circulation hole in a honeycomb segment is carried out in the end face of 1, and the closure of the opening of a residual circulation hole is carried out in other end faces, and it is desirable that the cross section consists of honeycomb segments more than whose 70 capacity %s of a honeycomb structure object are 2 900mm 2-10000mm.

[0010] The septum by which this invention has been arranged [2nd] inside a peripheral wall and said peripheral wall, The formation process which forms the honeycomb segment which has the circulation hole of a large number penetrated to the shaft orientations divided by said septum, It is the manufacture approach of the honeycomb structure object the 1st invention (it indicates in claim 1 thru/or any 1 term of 9) including the junction process which joins said honeycomb segment and forms a honeycomb structure object. Said formation process includes the baking process which calcinates the baking raw material containing particulate matter S. Said cement receives the mean particle diameter of the particulate matter S in said baking raw material, including the process which gives cement for said junction process to form a junctional zone on a peripheral wall, and the process which unifies a honeycomb segment. The manufacture approach of the honeycomb structure object characterized by including the particulate matter A which has the mean particle diameter of 1 / 100 - 1/2 is offered (2nd invention). In the 2nd invention, it is desirable to include the process at which said process which gives the cement for forming a junctional zone gives the interlayer agent for forming the interlayer of at least one layer on the peripheral wall of a honeycomb segment, and the process which gives the adhesives for forming the glue line of at least one layer.

[0011] The septum by which this invention has been arranged [3rd] inside a peripheral wall and said peripheral wall, The formation process which forms the honeycomb segment which has the circulation hole of a large number penetrated to the shaft orientations divided by said septum, It is the manufacture approach of the honeycomb structure object the 1st invention (it indicates in claim 1 thru/or any 1 term of 9) including the junction process which joins said honeycomb segment and forms a honeycomb structure object. The process at which said junction process gives the cement for forming the junctional zone of at least one layer, The manufacture approach of the honeycomb structure object characterized by said cement containing the liquid which has the surface tension of 70 or less dyn/cm in 25 degrees C including the process which unifies a honeycomb segment is offered (3rd invention). In the 3rd invention, it is desirable that said liquid which has the surface tension of 70 or less dyn/cm in 25 degrees C contains the organic substance which a consistency is the liquid of 0.9 - 1.1 g/cm3, and has surface tension smaller than water in 25 degrees C, and water.

[0012]

[Embodiment of the Invention] Hereafter, although the manufacture approach of the honeycomb structure object of this invention and a honeycomb structure object is explained to a detail according to a drawing, this invention is not limited to the following operation gestalten. In addition, unless a cross section has a notice especially in below, the perpendicular cross section to the direction of a circulation hole (X shaft orientations) is meant.

[0013] The honeycomb structure object 1 of the 1st invention is a honeycomb structure object with which it comes to carry out the junction unification of two or more honeycomb segments 12 which have a peripheral wall 7, the septum 2 arranged inside a peripheral wall 7, and the circulation hole 3 of a large number penetrated to X shaft orientations divided by the septum 2 through a junctional zone 8, as shown in drawing 1 (a), (b), and (c).

[0014] As shown in drawing 2 , a honeycomb structure object the important description of the 1st invention Respectively the thermal conductivity and thickness of a peripheral wall 7 kappac (W/mK) and dc(cm), Respectively the thermal conductivity and thickness of a junctional zone 8 which are formed on the peripheral wall 7 kappaa (W/mK) and da(cm), When the thermal conductivity and thickness of a layer which doubled the peripheral wall 7 and the junctional zone 8 are respectively set to kappa (W/mK) and d (cm) It is that the peripheral wall 7 and junctional zone 8 of which relation called d/[(kappaa/deca)+(kappac/dc)] >= kappa>=d / [(kappaa/deca) +(kappac/dc)] x0.6 consists are included. In addition, in this invention, thermal conductivity means the thermal conductivity of the thickness direction.

[0015] If thickness of the junctional zone 8 currently formed on dc (cm) and this peripheral wall in the thickness of a peripheral wall 7 is set to da (cm), thickness [of a layer (henceforth a circumscription layer) 9] d (cm) which doubled these both will become d=da+dc. Moreover, when

the thermal conductivity of kappac (W/mK) and a junctional zone 8 is set to kappaa (W/mK) for the thermal conductivity of a peripheral wall 7, the thermal conductivity kappa of the circumscription layer 9 (W/mK) is expressed with the following relational expression from the rule of mixture of serial relation.
Kappa/d = [(kappaa/deca) +(kappac/dc)] xX -- (1)
(Being here X= 0-1)
[0016] a formula -- (-- one --) -- setting -- X -- an interface -- it can set -- heat transfer -- a rate -- being shown -- X -- = -- one -- it is -- if -- an interface -- it can set -- thermal resistance -- a loss -- nothing -- heat -- conducting -- things -- being shown -- X -- = -- zero -- it is -- if -- an interface -- setting -- heat -- perfect -- intercepting -- having -- **** -- things -- being shown . If the value of X is smaller than 0.6, it will not depend on the value of the thermal conductivity of a junctional zone 8, but the temperature distribution in the honeycomb structure inside of the body will become an ununiformity because the thermal resistance in an interface becomes large, and it will become easy to produce a crack on a honeycomb structure object according to generating of thermal stress. Therefore, by making the value of X or more into 0.9 still more preferably 0.8 or more preferably 0.6 or more, conduction of the heat between honeycomb segments is performed smoothly, and can attain equalization of the temperature distribution of the honeycomb structure inside of the body.
[0017] d/[(kappaa/deca)+(kappac/dc)] >= kappa>=d / [(kappaa/deca) +(kappac/dc)] x0.6 -- preferably [namely,] d/[(kappaa/deca)+(kappac/dc)] >= kappa>=d / [(kappaa/deca) +(kappac/dc)] x0.8 -- still more preferably By being relation called d/[(kappaa/deca)+(kappac/dc)] >= kappa>=d / [(kappaa/deca) +(kappac/dc)] x0.9, equalization of the temperature distribution of the honeycomb structure inside of the body can be attained.
[0018] Although the honeycomb structure object of the 1st invention needs to include the peripheral wall and junctional zone which fill above-mentioned relational expression, it is desirable that each peripheral wall of a junctional zone and its both sides fills above-mentioned relational expression. Moreover, in the 1st invention, it is still more preferably desirable to fill the junctional zone which is boiled further and by which more than 90 capacity % is more preferably formed on the peripheral wall, and above-mentioned relation more than 70 capacity % more than 50 capacity % of the peripheral wall in which the junctional zone of a honeycomb segment is formed. It is that all peripheral walls fill most preferably the junctional zone currently formed on the peripheral wall, and the above-mentioned relational expression.
[0019] The desirable operation gestalt for decreasing the thermal resistance in the interface of a peripheral wall and a junctional zone, in order to satisfy above-mentioned relation is formed of baking of the baking raw material with which a peripheral wall contains particulate matter S, and is considering as the configuration containing the particulate matter A with which a junctional zone's has the mean particle diameter which is the range of 1 / 100 - 1/2 to the mean particle diameter of particulate matter S. Although an open pore and irregularity generally arise on the surface of a peripheral wall when a peripheral wall is formed of baking of the raw material containing particulate matter S, by including the particulate matter A which has mean particle diameter in this case with a junctional zone smaller than the mean particle diameter of the particulate matter S which is the raw material of a peripheral wall, particulate matter enters the open pore and crevice on the front face of a peripheral wall, the adhesion of an interlayer and a peripheral wall is improved according to an anchor effect, and the thermal resistance in an interface can be decreased. even if particulate matter A is too large and it is too small, sufficient anchor effect is acquired -- not having -- the desirable mean particle diameter of particulate matter A -- 1 / 100 - 1/2 of particulate matter S -- further -- desirable -- 1 / 75 - 1/5 -- it is the range of 1 / 50 - 1/10 most preferably.
[0020] Furthermore, as shown in drawing 3 , it is desirable to consider as a configuration including the interlayer 84 to whom a junctional zone 8 touches the glue line 82 of at least one layer and a peripheral wall 7. While giving the suitable bonding strength for a glue line 82 by considering as such a configuration and considering as the configuration containing the particulate matter A with which an interlayer 84 has the particle diameter of the above-mentioned range, an interlayer 84 can improve the adhesion of a glue line 82 and a peripheral wall 7, and can decrease the thermal resistance in an interface further.
[0021] When it has an interlayer 84 since a peripheral wall 7 exists in the both sides of a junctional

zone 8 as the honeycomb structure object of the 1st invention is shown in drawing 3 , as for an interlayer 84, it is desirable that there are two layers in both the outsides of a junctional zone 8. Although an interlayer 84 needs to be in contact with the peripheral wall 7, i.e., directly formed on a peripheral wall 7, in this operation gestalt The interlayer may be formed more than two-layer between the glue line and the peripheral wall. In this case It is desirable for adhesion with the peripheral wall containing the particulate matter A with which the interlayer currently directly formed on the peripheral wall has the particle diameter of the above-mentioned range to consider as a good presentation, and for the interlayer who is in contact with the glue line to consider as the presentation with sufficient adhesion with a glue line, and to change a sequential presentation.

[0022] Moreover, another desirable operation gestalt which decreases the thermal resistance in an interface is considering as the configuration containing the layer formed from the raw material with which a junctional zone's contains the liquid which has the surface tension of 70 or less dyn/cm in 25 degrees C. The crack of the interface generated by contraction at the time of desiccation or heating can be controlled by a junctional zone giving the cement in the condition that it can deform easily [a slurry, a solution, etc.], to a plane of composition generally, and making two planes of composition coalesce, and using a liquid with surface tension low as a component of the raw material for forming a junctional zone in this case, although it forms by carrying out desiccation, heating, etc. Since the crack of an interface increases the thermal resistance in an interface, it can control increase of the thermal resistance in an interface by controlling this. If the surface tension of a liquid is too large, the above problems will arise, and if too small, giving to a plane of composition will become difficult. Therefore, in 25 degrees C, the surface tension of the liquid concerned is 70 or less dyn/cm preferably, and is 20 or more dyn/cm still more preferably.

[0023] Although the liquid of 70 dyn/cm - 20 dyn/cm may be chosen and used as a liquid used for cement, when water is included as a component of the liquid concerned, the surface tension of water is about 72 dyn/cm in 25 degrees C. Therefore, it is desirable to lower the surface tension of water and, for that, it is desirable to consider as the configuration whose consistency adds the organic substance which is near and a liquid with small surface tension to water, and contains the organic substance concerned and water in water. In this case, in 25 degrees C, a consistency is the liquid of 0.9 - 1.1 g/cm3, mixing with water well is desirable and it is [it is desirable to have surface tension smaller than water, for example, the value of 40 - 70 dyn/cm, and] desirable [the organic substance concerned] that there is compatibility with water further. Specifically, an acetic acid, ethyl benzoate, an ethyl formate, dimethyl formamide, etc. are mentioned.

[0024] Since it will be easy to produce a crack in a thermal shock etc. if thermal expansion is too large, as for the junctional zone in the honeycomb structure object of the 1st invention, what has a comparatively low coefficient of thermal expansion is desirable. The range of 1x10-6 - 8x10-6/degree C is desirable, the coefficient of thermal expansion in the range of 20 degrees C - 800 degrees C of a junctional zone has the still more desirable range which is 1.5x10-6 - 7x10-6/degree C, and its range which is 2.0x10-6 - 6x10-6/degree C is the most desirable. Moreover, it is not desirable in order that thermal stress may concentrate on an interface at the time of heating and cooling, if the difference of the coefficient of thermal expansion of a junctional zone and a honeycomb segment is too large. The difference of the coefficient of thermal expansion to 20 degrees C - 800 degrees C of a junctional zone and a honeycomb segment is less than [1x10-6/degree C] preferably.

[0025] moreover, the ratio of thermal conductivity kappas of a honeycomb segment to thermal conductivity kappaa of a junctional zone, i.e., the ratio of kappa s/kappa a, -- 5-300 -- desirable -- 8-280 -- within the limits of 10-250 is still more preferably desirable. If a kappa s/kappa a value is too small, in order that a junctional zone may not contribute as a thermal break, the inclination for the temperature gradient in a honeycomb segment to be large arises according to the effectiveness that heat gets across to the next honeycomb segment through a junctional zone. On the other hand, to the honeycomb segment 12, if a kappa s/kappa a value is too large, since the thermal conductivity of a junctional zone is too small, the temperature gradient produced in a junctional zone will become large too much, and it will become easy to produce a crack in a junctional zone, and will result in breakage of a honeycomb filter depending on the case.

[0026] Even if the thickness da of a junctional zone is too thick, heat conduction between

honeycomb segments is checked and it is not desirable. Moreover, if the thickness of a junctional zone is too thin, sufficient bonding strength is not obtained and it is not desirable. The range of the thickness da of a junctional zone is 0.01-0.5cm preferably.

[0027] As for a junctional zone, it is desirable to use the ceramics as a principal component. One sort or two sorts or more of colloidal sols, such as a silica sol or alumina sol, Silicon carbide, silicon nitride, cordierite, an alumina, a mullite, a zirconia, The ceramics chosen from the group which consists of zirconium phosphate, aluminum titanate, titanias, and such combination, It is desirable to be formed of desiccation, heating, baking, etc. from the raw material containing one sort or two sorts or more, an inorganic binder, etc. of inorganic fibers, such as one sort of inorganic fine particles, such as a Fe-Cr-aluminum system metal, a nickel system metal, or Metals Si and SiC, or two sorts or more, and ceramic fiber. The colloidal sol is suitable in order to give adhesive strength, and inorganic fine particles are suitable in order to raise compatibility with the peripheral wall of a honeycomb segment, and its inorganic fine particles with near principal component of a honeycomb segment and value of thermal expansion are desirable. Moreover, the inorganic fiber is suitable as reinforcing materials who give toughness suitably to a junctional zone. When preparing a glue line and an interlayer into a junctional zone, a suitable component can be respectively chosen from the above-mentioned components, and it can use as a component of a glue line and/or an interlayer.

[0028] In the 1st invention, although the principal component of a honeycomb segment can consider the various ceramics of an oxide or a non-oxide etc. The cordierite from viewpoints, such as reinforcement and thermal resistance, a mullite, an alumina, Spinel, silicon carbide, and silicon carbide-cordierite system composite material, silicon-silicon carbide system composite material, It is desirable to consist of at least one sort of ingredients chosen from the group which consists of silicon nitride, lithium aluminium silicate, aluminum titanate, Fe-Cr-aluminum system metals, and such combination. Thermal conductivity and in respect of thermal resistance Especially silicon carbide or silicon-silicon carbide composite material is suitable. Here, a "principal component" means constituting more than 80 mass % still more preferably more than 70 mass % preferably more than 50 mass % of a honeycomb segment. Moreover, in the 1st invention, when a honeycomb segment uses composite material of metal silicon (Si) and silicon carbide (SiC) as a principal component, if there are too few Si contents specified by Si/(Si+SiC) of a honeycomb segment, the effectiveness of Si addition will become is hard to be acquired, and if 50 mass % is exceeded, effectiveness heat-resistant [which is the description of SiC], and high temperature conductive will become is hard to be acquired. Therefore, as for Si content, it is desirable that it is five to 50 mass %, and it is still more desirable that it is ten to 40 mass %.

[0029] As for the septum and peripheral wall of a honeycomb segment, in the 1st invention, it is desirable that it is the porous body which plays the role of a filter and/or catalyst support. Although there is especially no limit in the thickness of a septum and a peripheral wall, if a septum or a peripheral wall is too thick, the pressure loss at the time of a processed fluid penetrating a porous septum will become large too much, if a septum or a peripheral wall is too thin, reinforcement runs short, and it is not respectively desirable. The range of 30-2000 micrometers of 40-1000 micrometers of thickness of a septum is 50-500 micrometers most preferably still more preferably, and the range of 45-3000 micrometers of 60-1500 micrometers of thickness of a peripheral wall is 75-750 micrometers most preferably still more preferably. Moreover, if the thermal conductivity of the septum of a honeycomb segment and a peripheral wall is too small, conduction of the heat in a honeycomb segment and between a honeycomb segment is checked, and it is not desirable. The thermal conductivity of a septum and a peripheral wall is 20 - 50 W/mK most preferably 15 to 55 W/mK still more preferably ten to 60 W/mK.

[0030] although there is especially no limit in the cel consistency (the number of the circulation holes per unit cross section) of a honeycomb segment, if a cel consistency is too small in the 1st invention -- the reinforcement as a filter -- and effective -- GSA (geometric surface area) runs short, and if a cel consistency is too large, pressure loss in case a processed fluid flows will become large. a cel consistency -- desirable -- 6-2000 cel / square inch (0.9 - 311 cel / cm2) -- further -- desirable -- 50-1000 cel / square inch (7.8 - 155 cel / cm2) -- it is the range of 100-400 cel / square inch (15.5 - 62.0 cel / cm2) most preferably. Moreover, although there is especially no limit in the cross-section configuration (cel configuration) of a circulation hole, it is desirable that it is either of the viewpoint

on manufacture to triangles, squares, hexagons, and corrugated configurations.
[0031] In the 1st invention, although there is no limit in the magnitude of a honeycomb segment, if too small [if each segment is too large the problem of breakage by thermal stress will arise, and], the unification by manufacture or junction of each segment becomes complicated and is not desirable. the magnitude of a desirable honeycomb segment -- the cross section -- 900mm2-10000mm2 -- 900mm 2-5000mm, it is 2 900mm 2-3600mm, and it is still more preferably desirable most preferably 2 and that more than 70 capacity % of a honeycomb structure object consists of honeycomb segments of this magnitude. Although there is especially no limit in the configuration of a honeycomb segment, as shown, for example in drawing 1 (a), the thing whose cross-section configuration has the shape of a square and whose honeycomb segment is the square pole-like can be made into the shape of a basic form, and the configuration of the honeycomb segment by the side of a periphery can be suitably chosen according to the configuration of the honeycomb structure object at the time of unifying, as shown in drawing 1 (b) and (c).
[0032] The cross-section configuration of the honeycomb structure object of the 1st invention can make especially a limit the shape of a polygon and variant configurations, such as the shape of elliptical besides a circle configuration, a ball-race truck configuration, an ellipse configuration, a trigonum, an abbreviation trigonum, a rectangular head, and an abbreviation square, as there are not, for example, shown in drawing 1 (b). Moreover, although there is especially no limit in the thermal conductivity of the whole honeycomb structure object, heat dissipation is too large, and since temperature does not fully rise but regeneration efficiency falls at the time of playback, it is not desirable, even if it is the honeycomb structure object of the 1st invention, when thermal conductivity is too high. Moreover, since there is too little heat dissipation when thermal conductivity is too low, a temperature rise is too large and is not desirable. The thermal conductivity in 40 degrees C is 20 - 50 W/mK most preferably 15 to 55 W/mK still more preferably ten to 60 W/mK.
[0033] When using as DPF, as shown in drawing 4 , as for especially the honeycomb structure object in the 1st invention, it is desirable that the closure of the opening of predetermined circulation hole 3a is carried out in the end face 46 of 1, and the closure of the opening of residual circulation hole 3b is carried out in other end faces 48. As especially shown in drawing 4 , it is desirable that while becomes the opposite side mutually and the closure of the adjoining circulation hole 3 is carried out at the end so that end faces 46 and 48 may present the shape of a checker. Thus, by closing, in case the processed fluid which flowed from the end face 46 of 1 passes along a septum 2, it flows out of other end faces 48 and a processed fluid passes along a septum 2, a septum 2 can achieve the duty of a filter and can remove the specified substance.
[0034] Although mentioned as the ceramics which can be used suitable for an above-mentioned honeycomb segment as an ingredient used for the closure, or a metal, one sort or two sorts or more of ingredients chosen from inside can be used suitably.
[0035] When it is going to use the honeycomb structure object of the 1st invention for reforming of purification of the exhaust gas of burners, such as heat engines, such as an internal combustion engine, or a boiler, liquid fuel, or gaseous fuel as catalyst support, it is desirable to make the honeycomb structure object of the 1st invention support the metal which has a catalyst, for example, catalyst ability. It is desirable for Pt, Pd, Rh, etc. to be mentioned and to make a honeycomb structure object support at least one of sorts of these as a metaled typical thing which has catalyst ability.
[0036] The manufacture approach of the honeycomb structure object which is next the 2nd invention is explained. In the manufacture approach of the honeycomb structure object which is the 2nd invention, a honeycomb segment is first formed with a formation process. There is especially no limit in the formation approach of the honeycomb segment in a formation process, and although the approach of manufacturing the object which generally has honeycomb structure can be used, it can form, for example at the following processes.
[0037] Using particulate matter, such as at least one sort of ceramics chosen from the group which consists of silicon carbide, silicon nitride, cordierite, an alumina, a mullite, a zirconia, zirconium phosphate, aluminum titanate, titanias, and such combination, a Fe-Cr-aluminum system metal, a nickel system metal, or Metals Si and SiC, as particulate matter S in a baking raw material, binders,

such as methyl cellulose and hydroxypropoxyl methyl cellulose, a surfactant, water, etc. are added to this, and a reversible plastic matter is produced. Extrusion molding of this plastic matter is carried out, for example, and the honeycomb Plastic solid of the configuration which has the circulation hole of a large number penetrated to the shaft orientations divided by the septum is fabricated. After drying by microwave, hot blast, etc., the honeycomb segment 12 as shown in drawing 1 (a) can be formed for this by calcinating. The honeycomb segment formed here can be made into the desirable configuration where it explained in the 1st above-mentioned invention.

[0038] A honeycomb structure object is formed according to a junction process including the process which gives the cement for forming a junctional zone on the peripheral wall of a honeycomb segment next, and the process which unifies a honeycomb segment. The cement given in order that the important description of the 2nd invention may form a junctional zone in a junction process is 1 / 100 - 1/2, and that 1 / 75 - 1/3, and the particulate matter A that has the mean particle diameter of 1 / 50 - 1/4 most preferably are included still more preferably to the mean particle diameter of the particulate matter S used in a formation process. By baking of the baking raw material containing particulate matter S, although an open pore and irregularity generally arise on the surface of a peripheral wall, when cement contains the particulate matter A which has the mean particle diameter of the above-mentioned range in this case, particulate matter A enters the open pore and crevice on the front face of a peripheral wall, the adhesion of a junctional zone and a peripheral wall is improved according to an anchor effect, and heat conduction in both interface is improved.

[0039] One sort of inorganic fine particles, such as ceramics chosen from the group which consists of silicon carbide, silicon nitride, cordierite, an alumina, a mullite, a zirconia, zirconium phosphate, aluminum titanate, titanias, and such combination as particulate matter A, a Fe-Cr-aluminum system metal, a nickel system metal, or Metals Si and SiC, or two etc. sorts or more are desirable, and it is still more desirable that they are the particulate matter S used with a formation process and this quality of the material.

[0040] As for cement, it is still more desirable that one sort of inorganic fibers, such as one sort of colloidal sols, such as a silica sol or alumina sol, or two sorts or more, and ceramic fiber, or two sorts or more, an inorganic binder, an organic binder, etc. are included. Moreover, it is desirable at the point that it makes giving easy that the liquid component other than the above formed elements is included, and it is still more desirable that it is the slurry of a liquid component and a formed element.

[0041] There is especially no limit in the approach of giving cement on a peripheral wall, for example, it can give by spreading by the spray method, a brush, a brush, etc., a dipping method, etc.

[0042] In the 2nd invention, it may divide into multiple times and giving of cement may be given, although what is necessary is just to give one kind of cement once. Moreover, it is desirable to give two or more kinds of cement in 2 steps or more. In this case, it is desirable to include the process which gives the interlayer agent for [of two peripheral walls 7 which should be joined as shown in drawing 3 R> 3] at least on the other hand forming the interlayer 84 of at least one layer in both tops preferably, and the process which gives the adhesives for forming the glue line 82 of at least one layer. In this case, it is desirable that the particulate matter A with which the interlayer agent directly given on a peripheral wall has the mean particle diameter of the above-mentioned range is included. When a junction process includes such a process, good adhesion with a peripheral wall 7 can be given to the interlayer 84 formed on a peripheral wall 7, and good bonding strength can be given to a glue line 82. In addition, the junctional zone 8 formed in this case will consist of two or more layers containing the interlayer 84 of at least one layer, and the glue line 82 of at least one layer, and cement will contain both interlayer agent and adhesives.

[0043] As for an interlayer agent and adhesives, it is desirable that a formed element and a liquefied component are included, and it is desirable that it is a slurry-like further. Although illustrated as a desirable component to cement as a formed element of an interlayer agent and adhesives, it is desirable that what was chosen from inside is included. There is especially no limit in the approach of giving an interlayer agent and adhesives, and it can give by the same approach as giving of cement.

[0044] After adhesives give an interlayer agent, giving on it is desirable. In this case, you may give, without giving after giving an interlayer agent, after performing desiccation, heating, baking, etc.,

and carrying out desiccation, heating, baking, etc. after giving of an interlayer agent. Moreover, when giving an interlayer agent only to one side of a side attachment wall 7, adhesives may be directly given on the side attachment wall 7 of another side, and the sequence of giving of an interlayer agent and adhesives is not asked in this case.

[0045] Thus, after giving cement, each honeycomb segment is made to unify and a honeycomb structure object is formed. Then, firmer adhesive strength can be obtained by drying and/or calcinating further depending on the class of adhesives.

[0046] The manufacture approach of the honeycomb structure object which is next the 3rd invention is explained. In the manufacture approach of the honeycomb structure object which is the 3rd invention, a honeycomb segment is formed first. Like the 2nd invention, there is especially no limit in the manufacture approach of a honeycomb segment, and it can manufacture at the same process as the 2nd invention.

[0047] The honeycomb segment formed in the next is joined according to a junction process, and a honeycomb structure object is formed. A junction process includes the process which gives the cement for forming the junctional zone of at least one layer on the peripheral wall 7 which should be joined, and the process which unifies a honeycomb segment. The important description of the 3rd invention is that this cement contains the liquid which has preferably 70 or less dyn/cm of surface tension of 20 or more dyn/cm in 25 degrees C. Although cement generally contains a formed element and a liquid component, it can control the crack of the interface generated by contraction at the time of desiccation and heating of cement by including the liquid component which has the surface tension of the above-mentioned range.

[0048] In the junction process of the 3rd invention, although only one kind of cement may be given on a peripheral wall, after giving an interlayer agent which was stated by explanation of the 2nd invention, adhesives may be given from on the. In this case, as for an above-mentioned liquid, being contained in adhesives at least is [that what is necessary is to just be contained in either / at least / an interlayer agent or adhesives] desirable. Moreover, it is also desirable to manufacture a honeycomb structure object combining the 2nd invention and invention of the 3rd.

[0049] As mentioned above, a consistency can add at water the organic substance which is near and a liquid with small surface tension to water, and the liquid which has preferably 70 or less dyn/cm of surface tension of 20 or more dyn/cm in 25 degrees C can obtain it suitably by considering as the configuration containing the organic substance concerned and water. In this case, in 25 degrees C, a consistency is the liquid of 0.9 - 1.1 g/cm3, mixing with water well is desirable and it is [it is desirable to have surface tension smaller than water, for example, the value of 10 - 50 dyn/cm, and] desirable [the organic substance concerned] that there is compatibility with water further. Specifically, dimethyl formamide, an acetic acid, ethyl benzoate, an ethyl formate, etc. are mentioned.

[0050] When using for a filter, especially DPF, etc. the honeycomb structure object manufactured by the 2nd and/or the 3rd invention, it is desirable to carry out eye closure of the opening of a circulation hole by turns with a sealing agent, and it is desirable to carry out eye closure so that it may become checker-like by turns about an end face further. The eye closure by the sealing agent masks the circulation hole which does not carry out the eye closure, can be given to the opening end face of a honeycomb segment by the ability making a raw material into the shape of a slurry, and can perform it by calcinating after desiccation. In this case, since a baking process can be managed at once if eye closure is carried out between the production processes of an above-mentioned honeycomb segment (i.e., after shaping of a honeycomb segment), and before baking, it is desirable, but eye closure may be carried out after baking, and as long as it is after shaping, you may carry out anywhere. Although the ingredient of the eye sealing agent to be used can be suitably chosen out of the group mentioned as a raw material with the above-mentioned desirable honeycomb segment, it is desirable to use the raw material used for a honeycomb segment and the raw material of this quality of the material.

[0051] Moreover, a honeycomb structure object may be made to support a catalyst in this invention. The approach which this contractor usually performs is sufficient as this approach, for example, it can carry out the wash coat of the catalyst slurry, and can make a catalyst support by drying and calcinating. As long as this process is also after shaping of a honeycomb segment, you may carry out

at any time.
[0052]
[Example] Hereafter, although this invention is further explained to a detail based on an example, this invention is not limited to these examples.
[0053] (Production of a honeycomb segment) As a baking raw material, it mixed at a mass rate which shows particle-like SiC powder (particulate matter S) and metal Si powder in Table 1, methyl cellulose and hydroxypropoxyl methyl cellulose, a surfactant, and water were added to this, and the reversible plastic matter was produced. Extrusion molding of this plastic matter was carried out, it dried by microwave and hot blast, and septum thickness acquired 380 micrometers, the square about 31.0 cels / cm2 (200 cel / square inch), and whose cross section 500 micrometers and a cel consistency are 35mm per side for the thickness of a peripheral wall, and honeycomb Plastic solids A and B whose die length is 152mm. After while became the opposite side mutually, and said adjoining circulation hole carried out eye closure and dried this with the ingredient used for manufacture of a honeycomb segment at the end, and the same ingredient so that an end face might present the shape of a checker, it degreased at about 400 degrees C among the atmospheric-air ambient atmosphere, it calcinated at about 1450 degrees C in Ar inert atmosphere after that, and the honeycomb segments A and B of the Si association SiC were obtained.
[0054]
[Table 1]

ハニカムセグメント	SiC平均粒子径[μm]	SiC配合量[質量%]	金属Si平均粒子径[μm]	金属Si配合量[質量%]	平均細孔径[μm]	気孔率[%]	4点曲げ強度[MPa]	ヤング率[GPa]	熱伝導率[W/mK]
A	32.6	80	4	20	10	45	20	15	25
B	50	70	4	30	15	40	35	25	35

[0055] (Preparation of adhesives) By the presentation shown in Table 2, clay was mixed in the nature fiber of aluminosilicate with a mean particle diameter of 100 micrometers, particle-like silicon carbide with a mean particle diameter of 10 micrometers, the silicic acid zirconium, and the 40 mass % silica sol water solution as an inorganic binder, the water of the amount shown in Table 2 was added to them, using water and dimethyl formamide as a liquid component, kneading was performed for 30 minutes using the mixer, and Adhesives A and B were obtained. It asked for the surface tension of a liquid component by the capillary tube method.
[0056]
[Table 2]

接着剤	アルミノシリケート繊維[質量%]	炭化珪素[質量%]	シリカゾル[質量%]	粘土[質量%]	水[質量%]	ジメチルフォルムアミド[質量%]	液体成分の表面張力[dyn/cm]	熱伝導率[W/mK]	密度[g/cm^3]
A	32	37	20	1	8	2	60	0.3	1
B	32	37	20	1	10	—	72	0.9	1.7

[0057] (Preparation of an interlayer agent) The particle-like silicon carbide (particulate matter A) of mean particle diameter and 40 mass % silica sol water solution which are shown in Table 3 as an interlayer agent were mixed, and water was added to this, it considered as the slurry, and interlayer agent A-D was obtained.
[0058]
[Table 3]

中間層剤	炭化珪素[質量%]	平均粒子径 [μm]	シリカゾル[質量%]	水[質量%]
A	37.5	3	25	37.5
B	37.5	11	25	37.5
C	37.5	0.2	25	37.5
D	37.5	20	25	37.5

[0059] (Examples 1-5 and examples 1-4 of a comparison) In the combination shown in Table 4, adhesives were applied, after applying an interlayer agent to the thickness of about 30 micrometers on the peripheral wall of a honeycomb segment. And honeycomb segments were unified in the combination shown table 4, and the 144mm(5.66 inches) x152mm (6 inches) honeycomb structure

object for DPF was produced. The interface of the peripheral wall of a honeycomb structure object and junctional zone which were obtained was observed with the optical microscope, the generating degree of a crack was evaluated, and the result was shown in Table 4. Moreover, it asked for the thermal conductivity of the peripheral wall of a honeycomb segment, a junctional zone, and a circumscription layer with the laser flash method separately, respectively, and it substituted for the formula (1), the value of X was calculated, and it was shown in Table 4.

[0060] The honeycomb structure object acquired in examples 1-5 and the examples 1-4 of a comparison is connected to the exhaust pipe of the 3l. diesel power plant of direct injection types. An engine is operated using the gas oil containing 30 ppm Ce fuel additive made from low DIA. After accumulating the soot of the amount of conventions in a honeycomb structure object, the temperature up of the honeycomb structure object was continuously carried out to 600 degrees C with the propane gas burner, the honeycomb structure inside of the body was made into 18% of oxygen density by the change of a bypass valve, soot was burned, and the honeycomb structure object was reproduced. 2g / the amount of uptake deposition soots with which increase every [L] and the crack was accepted to be to the end face of a honeycomb structure object in microscope observation was made into the amount of marginal soots from 4 g/L, and the amount of soot was shown in Table 4.

[0061]

[Table 4]

	ハニカムセグメント	接着剤	中間層剤	X値	界面観察結果	限界スート堆積量(g／L)
実施例1	A	A	—	0.9	クラックなし	10
実施例2	A	B	A	0.85	クラックなし	12
実施例3	A	B	B	0.7	クラックなし	12
実施例4	A	A	A	0.98	クラックなし	12
実施例5	B	A	—	0.95	クラックなし	12
比較例1	A	B	—	0.5	一部クラック	8
比較例2	A	B	C	0.5	一部クラック	8
比較例3	A	B	D	0.3	全体クラック	6
比較例4	B	B	—	0.55	一部クラック	8

[0062] As shown in Table 4, as for the honeycomb structure object of examples 1-5, a crack was not observed in initial interface observation, but the good adhesion in the interface of a peripheral wall and a junctional zone was shown. Furthermore, as compared with the honeycomb filter of the examples 1-4 of a comparison, the value of the amount of marginal soots is large, and it turns out that the honeycomb filter of this invention is clearly excellent in endurance.

[0063]

[Effect of the Invention] As stated above, since the value of X in a formula (1) was 0.6 or more, adhesion of the interface of a peripheral wall and a junctional zone became good, and the honeycomb structure object of the 1st invention showed good endurance. Moreover, the honeycomb structure object of the 1st invention was able to be suitably manufactured by the 2nd and/or 3rd invention. In addition, although the honeycomb structure object of this invention is used especially suitable for DPF, the effectiveness of this invention suppresses an extremes-of-temperature rise of a honeycomb structure object, and is to make the temperature distribution of the honeycomb structure inside of the body into homogeneity, and the application is not restricted only to DPF.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The typical perspective view in which the typical perspective view showing one gestalt of the honeycomb segment which (a) requires for this invention, and (b) show one gestalt of the honeycomb structure object of this invention, and (c) are the typical top views showing one gestalt of the honeycomb structure object of this invention.
[Drawing 2] It is the typical enlarged drawing of the II section in drawing 1 (c).
[Drawing 3] It is the typical enlarged drawing of the part corresponding to the II section in drawing 1 (c) showing another gestalt of the peripheral wall of the honeycomb structure object of this invention, and a junctional zone.
[Drawing 4] (a) is the typical perspective view showing another gestalt of the honeycomb structure object of this invention, and (b) is the typical enlarged drawing of the IVb section in (a).
[Drawing 5] (a) is the typical perspective view showing the conventional honeycomb structure object, and (b) is the typical enlarged drawing of the Vb section in (a).
[Description of Notations]
1 [-- A peripheral wall, 8 / -- A junctional zone, 9 / -- A circumscription layer, 12 / -- A honeycomb segment, 42 / -- An input side edge side, 44 / -- 46 A tap hole side edge side 48 / -- An end face, 82 / -- A glue line, 84 / -- Interlayer.] -- A honeycomb structure object, 2 -- A septum, 3, 3a, 3b -- A circulation hole, 7

[Translation done.]

* NOTICES *

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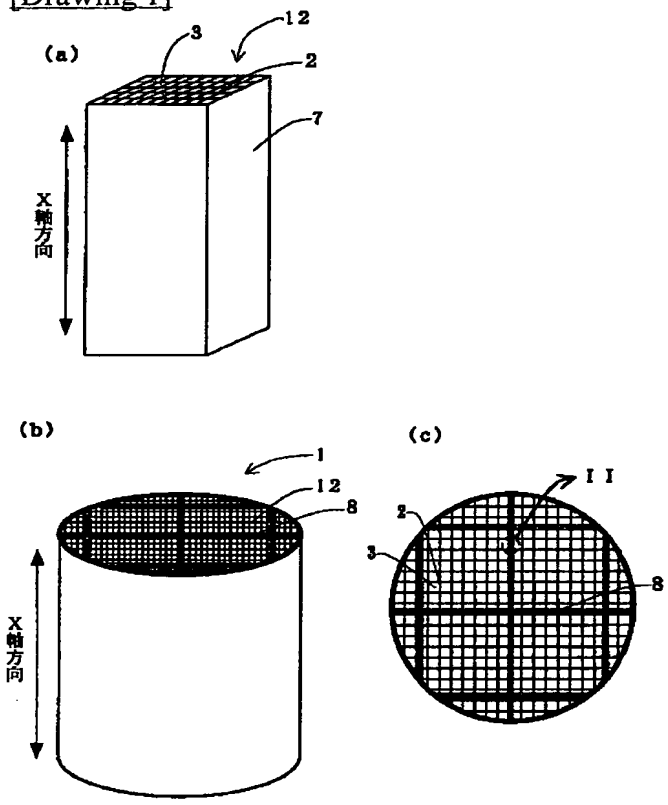
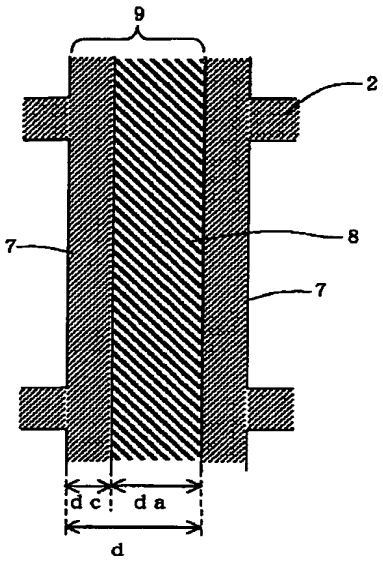
DRAWINGS

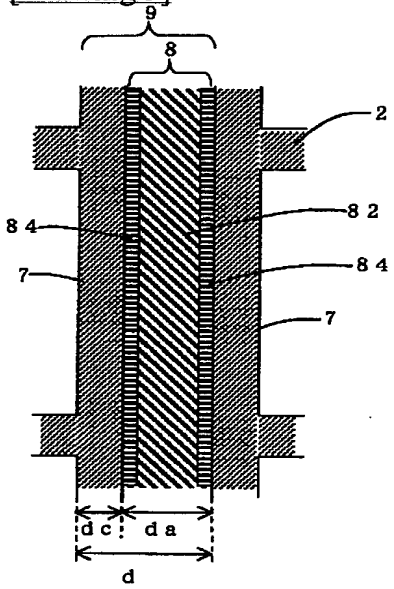
[Drawing 1]



[Drawing 2]

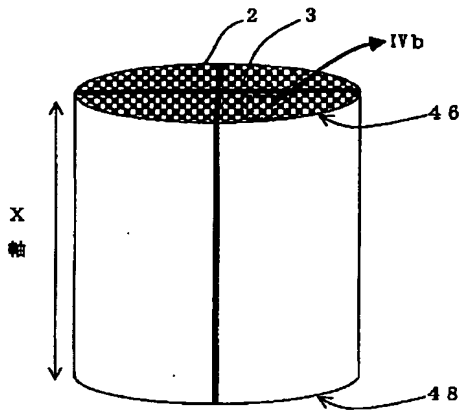


[Drawing 3]



[Drawing 4]

(a)



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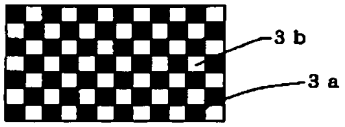
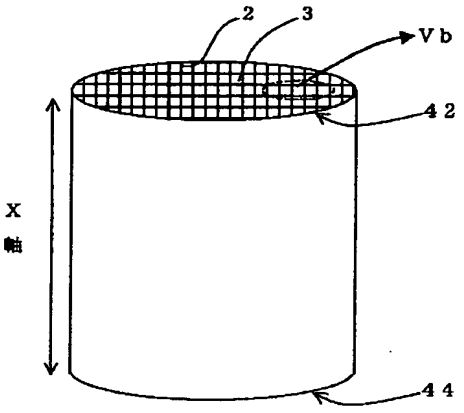


[Drawing 5]

(a)



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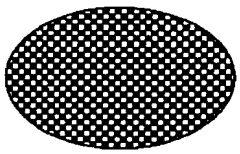

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